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RESEARCH ARTICLE

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Global and Regional IUCN Red List Assessments: 8

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Abstract

In this contribution, the conservation status assessment of four vascular plants according to IUCN categories and criteria are presented. It includes the assessment of *Ophrys normanii* J.J.Wood at global level, and the regional assessment of *Genista anglica* L., *Helianthemum lippii* (L.) Dum.Cours., and *Scrophularia lucida* L. (Italy).

Keywords

conservation, extinction risk, IUCN protocol, threats

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How to contribute

The text of the global and regional assessments should be submitted electronically to Simone Orsenigo (simone.orsenigo@unipv.it) or to Giuseppe Fenu (gfenu@unica.it); the text, up to 8,000 characters in length (spaces included), must include a distribution map and a picture of the assessed species.

Red List assessments

Ophrys normanii J.J.Wood

Global Assessment
Taxonomy and nomenclature
Order: Asparagales *Family*: Orchidaceae

O. ×*maremmae* O.Danesch & E.Danesch nothosubsp. *woodii* H.Baumann & S.Kunkele. Corrias, Inform. Bot. Ital. 15(2/3):178. (1983) 1985

Common name: Ophrys of Norman (En), Ofride di Norman (It).

Geographic distribution range: *Ophrys normanii* (Fig. 1) is endemic to Sardegna and its distribution consists of only three populations located in the south-western portion of the island (Fig. 2).

Distribution: *Countries of occurrence*: Italy (Sardegna).

Biology: *Plant growth form:* perennial (geophyte).

Flowering and fruiting time: flowering from April to May and fruiting from May to June.

Reproduction: Entomophilous pollination based on the sexual deception of males of *Bombus vestalis* Geoffroy, 1785 (Hymenoptera, Apidae). Seed dispersion is anemochorous.

Habitat and Ecology: *Ophrys normanii* shows a narrow altitudinal range from 200 to 400 m a.s.l. This species prefers deep and mature soils originating from carbonate rocks. Usually, it grows in underbrush and clearings of forests dominated by *Quercus ilex* L., rarely at the edge of maquis.

Population information: the main population is located in the Municipality of Buggerru, consisting in approximately 100 individuals organised into seven groups. The population of Fluminimaggiore consists of a single group counting approximately 15 individuals, while another 15 scattered individuals grow in the area of "Arenas-Baueddu". In the municipality of Domusnovas, approximately 100 individuals occur in three groups. A few scattered individuals are also present between Iglesias and Cagliari.

Threats: 2.3.1 *Nomadic grazing:* the high number of wild boars (*Sus scrofa* L.) and sheep (*Ovis aries* L.) grazing during the reproductive period of this plant limit its fitness.

Figure 1. Flowers of *Ophrys normanii*. Photograph by V. Rodi.

Figure 2. Geographic range and distribution map of *Ophrys normanii*.

2.2 *Wood plantations:* silvicultural activities cause damage to the population (this threat exists especially in the main population located in the municipality of Buggerru).

5.2 *Gathering terrestrial plants:* populations are subjected to the attention of photographers, orchid lovers and collectors that harm the plants and collect individuals.

CRITERIA APPLIED:
Criterion C: total population assessed in less than 2,500 mature individuals;
C2) a continuous decline in the number of mature individuals (mainly related to voluntary collection) was observed;
ai) Population structure with no population outnumbering the 250 mature individuals.
Criterion D: Total population assessed in less than 1000 mature individuals.

EN	**Endangered**	**C2a(i)**

Rationale for the assessment: *Ophrys normanii* is endemic to SW-Sardegna, and threatened by multiple factors directly or indirectly linked to human activity. The current global population counts approximately 400 mature individuals, distributed in three main populations: one larger and two smaller ones with few mature individuals. Considering that all populations are subjected to a continuous decline, mainly due to the collection of individuals, and that no population shows more than 250 mature individuals, this species can be considered as endangered (EN).

Previous assessment: this species was recently assessed as near threatened (NT) in Italy (Orsenigo et al. 2018), but new field data allowed us to reconsider its assessment.

Conservation actions: *Ophrys normanii* is not protected by any international, national or regional specific law. Nevertheless, the populations located in the municipalities of Buggerru and Domusnovas are included in the SCI areas "Is Compinxius – Campo Dunale di Buggerru – Portixeddu" (ITB042247) and "Monte Linas – Marganai" (ITB041111) respectively.

Conservation actions needed: research activities and especially monitoring programs are encouraged in order to better understand the autecology of this species; *ex situ* conservation could prevent the risk of extinction.

Note: This species was initially considered as hybridogenous (Corrias 1985). Nevertheless, recent studies (Goegler et al. 2009, 2015) demonstrated how this hypothesis is not correct.

P. Cortis, A. De Agostini, M. Lussu

Genista anglica L.

Regional assessment (Italy)
Taxonomy and nomenclature
Order: Fabales *Family*: Fabaceae

Genista anglica L., Sp. Pl.: 710 (1753)

Common name: Petty whin (En), Ginestra d'Inghilterra (It).

Geographic distribution range: *Genista anglica* (Fig. 3) is a western European species, reaching northwards Great Britain, eastwards southern Sweden and northern Germany. The southern portion of the range is found in the southern Italian peninsula (Gibbs 1968). In this context, the Italian populations represent a striking disjunction, as they are separated by thousands of kilometres from the closest ones occurring in southern France. In Italy, *G. anglica* is confined to the southern extreme of the peninsula. Here, this plant inhabits a reduced number of sites, which are split into three distinct groups, namely in Sila, Serre Calabre, and Aspromonte mountains (Fig. 4). Brullo et al. (2001a, 2001b) described the isolated Italian populations as two endemic taxa (*G. silana* Brullo, Gangale & Spamp. and *G. brutia* Brullo, Scelsi & Spamp.). However, this taxonomic treatment was rejected by Prieto et al. (2016), who evidenced a high relatedness among Italian and Iberian populations.

Distribution: Countries of occurrence: Belgium, Denmark, France, Germany, Great Britain, Italy, Netherlands, Portugal, Spain, and Sweden.

Biology: *Plant growth form:* perennial (suffruticose chamaephyte/nanophanerophyte).

Flowering time: From April to June.

Reproduction: This species is mainly pollinated by honeybees and bumblebees (Tsaliki and Diekmann 2011), and seed dispersal mainly relies on explosive dehiscence.

Habitat and Ecology: *Genista anglica* is typical of Atlantic heathland communities. In southern Italy, this plant usually occurs in mountain plains, at the border of wetlands (Gentile 1979, Gargano et al. 2007) or within scrublands dominated by *Cytisus scoparius* (L.) Link (Brullo et al. 2001b).

Population information: There is no detailed information available on population dynamics; however, many populations are declining due to various kinds of habitat modification.

Threats: *2.1. Annual & perennial non-timber crops*: in some sites, the expansion of cultivations causes a reduction on natural habitats.

2.3. Livestock and farming and ranching: trampling and grazing due to nomadic domestic animals affects the quality of many areas colonized by the species.

7.2. Dams & water management/use: in many sites, the species suffers for variations in the hydrological regimes, due to the presence of small and large dams, and the removal of surface water for agricultural use.

7.3. Other ecosystems modifications: locally, vegetation dynamics can originate habitat variations, which are unfavourable for the plant.

9.3.1. Nutrient loads: The proximity to cultivated lands and the long-lasting presence of livestock promote soil eutrophication in numerous occurrence sites.

CRITERIA APPLIED:

Criterion B: **EOO:** 3,920 km^2 calculated with minimum convex hull polygon in QGIS.
AOO: 200 km^2 calculated with a 2×2 km fixed cell grid (Gargano 2011).

a) Number of locations: overall, we identified nine locations based on the main threat affecting the species in a given area. According to this criterion, the populations occurring in Aspromonte can represent a unique location subjected to the expansion of

Figure 3. *Genista anglica* at Silvana Mansio (Serra Pedace, Cosenza; Calabria), a locality included in the Sila National Park. Photograph by L. Bernardo.

Cytisus scrublands. Instead, the two isolated populations found in Serre Calabre can be considered as two distinct locations threatened by site modifications, which are inducing variations of the local water regime. In the Sila mountain range, the major threat affecting *G. anglica* populations at higher elevation is the eutrophication related to grazing. Based on this threat, we identified five locations. Instead, at lower altitudes, the sites found in this mountain area are affected by soil consumption for agriculture and by eutrophication caused by the extensive use of fertilizers. In this case, the aggregation of contiguous sites allows the identification of a single location. b) Habitat extent and quality (iii) are declining in many sites, as well as the number of mature individuals (v). A reduction of AOO (ii) is likely to have affected the species in Italy, especially in the southern part of its regional range, but it is difficult to quantify due to the precision gaps in historical records. No documented decline of the regional EOO.

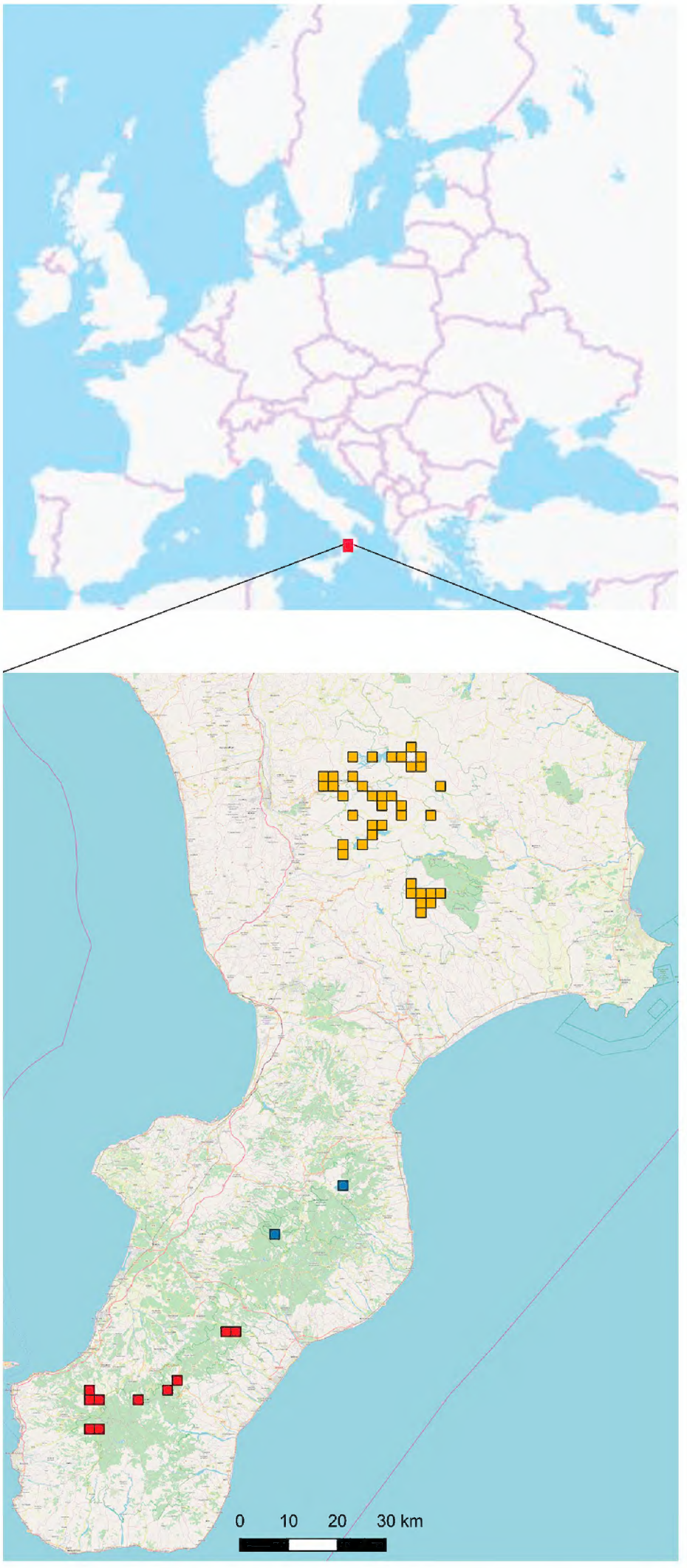

Figure 4. Position of the study area in the European context (upper side), and location of the Italian populations of *Genista anglica* (lower side). Brown squares, localities in Sila; blue squares, localities in Serre Calabre; red squares, localities in Aspromonte.

Red List category and Criteria (Regional Assessment)

VU	**Vulnerable**	**B1ab(ii,iii,v)+2ab(ii,iii,v)**

Rationale for the assessment: In Italy, *Genista anglica* is restricted to a reduced number of sites on three mountain areas located in the extreme southern part of the Italian peninsula. The regional distribution range consists in an EOO of 3,920 km^2 and an AOO of 200 km^2. This species is threatened by various kinds of habitat modifications, including expansion of cultivated lands, grazing, adverse vegetation dynamics, soil eutrophication, hydrological variations. Based on the prevalent threats acting across its regional range, *G. anglica* occurs in less than 10 locations. Because of the rarity and the overall decline of area of occupancy, habitat extent and quality, and population size promoted by the above-listed threats, this taxon qualifies as Vulnerable (VU) at the regional level. The geographical isolation makes unlikely any contribution of the European *G. anglica* populations to the conservation status of the Italian ones. Therefore, there is no reason for up- or down-grading the level of conservation concern established during the assessment procedure.

Previous assessment: The taxon is not evaluated (NE) at the global level (IUCN 2019).

Conservation actions: All the known Italian populations of *Genista anglica* occur within national and regional protected areas, namely: Sila National Park, Regional Park of Serre Calabre, and Aspromonte National Park.

Conservation actions needed: improved site management, in order to preserve habitat extent and quality, with a major attention to the control of scrub encroachment and the preservation of hydrological, and nutritional soil properties.

D. Gargano, C. Gangale, L. Bernardo

Helianthemum lippii (L.) Dum.Cours.

Regional Assessment (Italy)
Taxonomy and nomenclature
Order: Malvales *Family*: Cistaceae

Helianthemum lippii (L.) Dum.Cours., Bot. Cult. 3: 130 (1802) ≡ *Cistus lippii* L., Mant. Pl.: 245 (1771) = *Helianthemum sessiliflorum* (Desf.) Pers., Syn. Pl. 2: 78 (1806).

Common name: Sun rose (En), Eliantemo di Lippi (It), Raqrouq (Ar).

Geographic distribution range: *Helianthemum lippii* (Fig. 5) grows in the Middle East, Arabian Peninsula, and North Africa (Escudero et al. 2007), where it is well suited to severe climatic conditions (Greuter et al. 1984, Dobignard and Chatelain 2011), and in the Mediterranean Basin (GBIF Secretariat 2017). In Italy, the presence of *Helianthemum lippii* is reported for southern regions (Francini

Figure 5. *Helianthemum lippii* in Sicily. Photograph by G. Domina.

1953, Brullo et al. 1987; Fig. 6), for the northwestern coast of Sicily, and on the southwestern coast of Puglia (observations by P. Medagli and G.N. Silletti). According to Venturella et al. (2015), the populations of *Helianthemum lippii* previously reported from Calabria are currently doubtful and should be excluded from the vascular flora of this Region.

Figure 6. Geographic range and distribution map of *Helianthemum lippii* in Sicily and Puglia.

Distribution: *Countries of occurrence*: Algeria, Egypt, Greece, Iran, Iraq, Israel, Italy (mainland and Sicily), Jordan, Kuwait, Lebanon, Libya, Malta, Morocco, Oman, Pakistan, Qatar, Syria, Spain, and Tunisia.

Biology: *Plant growth form:* Perennial (nanophanerophyte). *Chromosome number: 2n = 20* (Díaz Lifante et al. 1992).

Flowering and fruiting time: Flowering and fruiting periods in the Mediterranean area range from April to May.

Reproduction: No detailed information on pollination, dispersal strategy, and seed germination is available.

Habitat and Ecology: *Helianthemun lippii* is a perennial shrub typical of arid grasslands and marine sands, growing in Sicily and in Puglia from 0 to 300 m a.s.l. (Pignatti 1982).

Population information: Direct observations indicate that in several localities, such as Balestrate (Palermo), Macconi Cava Cammarata (Gela), Biviere and Macconi di Gela (Gela), Contrada Dirillo (Acate, province of Ragusa), Pineta Vittoria (Vittoria, province of Ragusa), and Vallata del Fiume Ippari (Pineta di Vittoria)

(Vittoria, province of Ragusa) the populations are declining. Conversely, the populations in Piano Stella (Gela), Piano del Duca (Gela), Cava Randello and Passo Marinaro (province of Ragusa) are stable, while in Contrada Pirrera (Acate, province of Ragusa) the population is increasing. In Lido Azzurro, Bosco Tagliacozzo, Dune di Patemisco, Foce del fiume Tara, and Pineta di Chiatona (province of Taranto) populations are stable.

Threats: *1.1. Housing and urban areas:* In the northwestern part of Sicily (Balestrate, province of Palermo), the population grows in an expanding residential area, that has a negative impact of the population of *H. lippii*.

4.1. Roads and railroads: The population of Balestrate (province of Palermo) is threatened by the construction of an access road to a residential area.

2.1 Annual and perennial non-timber crops: In southern areas of Sicily, such as Macconi Cava Cammarata (Gela), Piano Stella (Gela), and Passo Marinaro (province of Ragusa) the populations are located in intensive agricultural areas, among greenhouses.

2.3.1 Nomadic Grazing: In southern Sicily, such as in Piano Stella (Gela), Piano del Duca (Gela), Acate Pirrera (Ragusa), Acate Dirillo (Ragusa), and Pineta Vittoria (Ragusa), the populations are subjected to sheep and goat overgrazing.

3.2 Mining and Quarrying: In southern Sicily, such as in Macconi Cava Cammarata (Gela), and Passo Marinaro (Ragusa), the populations grow in areas used as sand quarries.

6.1 Recreational Activities: In Puglia, the populations are located in a seaside area affected by heavy tourism, in particular in the proximity of equipped beaches set up during the summer season.

7.1 Fire & Fire suppression: The populations in Piano Stella (Gela), Piano del Duca (Gela), Acate Pirrera (Ragusa), Acate Dirillo (Ragusa), and Pineta Vittoria (Ragusa) are frequently burnt by fires.

CRITERIA APPLIED:

Criterion B: **EOO**: 41,917 km^2 calculated with GeoCAT (Geospatial Conservation Assessment Tool) programme (Bachman et al. 2011).

AOO: 48 km^2 calculated with GeoCAT (Geospatial Conservation Assessment Tool) programme (Bachman et al. 2011).

No. of Locations > 10 (identification based on the main threat affecting the species in a given area).

Decline: direct observation of a decline in EOO, number of populations and number of mature individuals.

Criterion D: Total population assessed in more than 1000 mature individuals.

Red List category and Criteria (Regional Assessment)

NT	**Near Threatened**

Rationale for the assessment: *Helianthemum lippii* shows a wide distribution, ranging from the Mediterranean area to central Asia (Pakistan). In Italy, the distribution of

this species is limited to a restricted portion of Sicily and Puglia, where the population suffers multiple threats causing a decline in EOO, in number of populations/localities and in number of mature plants. The known Italian populations of *Helianthemum lippii* consist of more than 1000 mature individuals. Although the populations of *H. lippii* are threatened by several natural and human-related factors and a decline was observed in several populations, the populations are not severely fragmented, the number of locations was higher than 10 and the total number of mature individuals was higher than 1000. For all these reasons, this species is classed as Near Threatened (NT) at regional level (Italy).

Previous assessment: *Helianthemum lippii* was not previously evaluated (NE) at a global level (IUCN 2019). A preliminary assessment of *H. lippii* in Sicily as an endangered taxon was provided by Raimondo et al. (2011), without any further explanation.

Conservation actions: *Helianthemum lippii* is not protected at either regional, national or international levels. No seed collection from the Italian population exists in germplasm banks.

Conservation actions needed: Monitoring activities of the habitats and populations of *Helianthemum lippii* should be activated. *In situ* and *ex situ* conservation strategies should be planned to protect this rare and threatened plant in Italy from further decline.

R. Calvo, M.L. Gargano, S. Sciandrello

Scrophularia lucida L.

Regional Assessment (Italy)

Taxonomy and nomenclature

Order: Lamiales *Family*: Scrophulariaceae

Scrophularia lucida L., Syst. Nat. 10 (2): 1114 (1759) = *Scrophularia provincialis* Rouy, Bull. Soc. Bot. France 38: 264 (1891) = *Scrophularia rutifolia* Boiss., Fl. Or. 4 (2): 404 (1879)

Common name: Apulian figwort (En), Scrofularia pugliese (It).

Geographic distribution range: *Scrophularia lucida* (Fig. 7) is distributed in the eastern Mediterranean Basin (Marhold 2011+; Fig. 8). Populations in the Maritime Alps, France, represent the westernmost limit of its range. In Italy, this species occurs only in the administrative regions of Puglia and Basilicata, while it is no longer recorded in Liguria and erroneously recorded in Piemonte (Bartolucci et al. 2018). The Italian populations are located along coasts and hinterland of central-southern Puglia, while it is rarer in Basilicata. In Puglia, it is reported for Monopoli (Perrino and Signorile 2009), Polignano a Mare (Perrino et al. 2013), Lama Belvedere (2005, F. Angiulli, BI n. 35404.) (Province of Bari); Cisternino (observation by E.V. Perrino), Fasano (Perrino et al. 2014), Rosa Marina along the gravine, Gravina di San Biagio and Santa

Figure 7. *Scrophularia lucida* photographed at Fasano (Brindisi). Photograph by E.V. Perrino.

Figure 8. Geographic range and distribution map of *Scrophularia lucida* L.

Maria d'Agnano (Ostuni; observations by P. Medagli), Lamaforca and Torre Santa Sabina (Carovigno; Province of Brindisi; observation by E.V. Perrino); several more or less continuous localities in Salento from Otranto to S. Maria di Leuca, and other sites

at Rupi di S. Mauro (Gallipoli), Montagna Spaccata (Galatone), Torre Uluzzo and Torre dell'Alto at Porto Selvaggio (Nardò; province of Lecce; observations by P. Medagli), Gravina di Palagianello, Gravina di Castellaneta, Gravina di Laterza, Grottaglie at the Gravina di Fantiano, Gravina di Fullonese and Gravina di Riggio, Massafra at Gravina della Madonna della Scala, Statte at the Gravina di Leucaspide, Gravina di Ginosa (Province of Taranto). In Basilicata, this species is reported for Gravina di Matera (Medagli and Gambetta 2003, Terzi and D'Amico 2008) and Picciano (Matera; observation by P. Medagli).

Distribution: *Countries of occurrence*: France, Greece, Jordan, Israel, Italy, Lebanon, Syria, and Turkey.

Biology: *Plant growth form:* biennial/perennial (hemicryptophyte/chamaephyte). *Chromosome number:* $2n$ = 24, 26 (Kamari et al. 1995, Pignatti 2018).

Flowering time: From April to late July.

Reproduction: Each ripening capsule disperses several small seeds (balistochorous dissemination), that can be transported by ants (myrmecochorous dissemination). Therefore, this species displays a low ability to increase its range due to its dissemination strategies.

Habitat and Ecology: *Scrophularia lucida* grows in rocky limestone cliffs from sea level to 400 m a.s.l., colonizing natural rock crevices (Perrino et al. 2013). Its habitat is protected by the Habitats Directive 92/43/EEC, as "Calcareous rocky slopes with chasmophytic vegetation" (code 8210) (Biondi and Blasi 2009). In Italy, *S. lucida* is considered a characteristic species of the endemic alliance *Caro multiflori-Aurinion megalocarpae* Terzi *et* D'Amico 2008 (Terzi and D'Amico 2008).

Population information: There is no information available on population dynamics.

Threats: *6.1 Recreational activities:* the populations near the coast could be affected by the tourists in summer just when this species is flowering and fruiting.

7.1.1 Increase in fire frequency/intensity: an increase in fire frequency or intensity would negatively affect the populations.

10.3 Avalanches and landslides: some populations can be lost or reduced by landslides caused by the erosion of the slopes where the plant grows.

CRITERIA APPLIED:

Criterion B: **EOO:** 8,964 km^2 calculated with minimum convex hull (with Google Earth Pro)

AOO: 180 km^2 calculated with a 2×2 km cell fixed grid

a) Not severely fragmented; number of locations > 10

b) No continuing decline

c) No extreme fluctuations

Red List category and Criteria (Regional Assessment)

LC	Least Concern

Rationale for the assessment: *Scrophularia lucida* is an east-Mediterranean species currently occurring in Italy only in Puglia and Basilicata. The habitat of this species is

quite conservative and neither continuing decline nor extreme fluctuations have been observed or can be projected. The distribution is not severely fragmented and the identified threats are only potential in most of the occurrence sites. Therefore, this species is assigned to the Least Concern (LC) category.

Previous assessment: This species was not previously evaluated (NE), neither at national (Italy) nor at global level (IUCN 2019).

Conservation actions: *Scrophularia lucida* is unprotected by international, national or regional laws.

Conservation actions needed: Research activities and monitoring programs are recommended in order to better understand the reproductive biology of this species and its population trend. Moreover, *ex situ* germplasm resource banking is recommended, for possible plant translocation programmes aimed at increasing the low number of individuals of the subpopulations.

Notes: Recently, some authors reported the antitumoral (breast cancer) activity of some metabolites of *S. lucida* (Lewenhofer et al. 2018).

E.V. Perrino, R.P. Wagensommer, P. Medagli

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